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Case report

How to do identify single cases according to the quality assurance from IOFOS. The positive identification of an unidentified body by dental parameters: A case of homicide

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ABSTRACT

The positive identification of skeletal by individual dental parameters is one of the objectives of the criminal investigation. The intervention of Forensic Dentistry in some circumstances may represent the only way to obtaining a positive identification of an unidentified bodies. The teeth constitute a scientific method in forensic identification, principally due to the great resistance to the agents who provoke the destruction of the soft tissues in the corpses (putrefaction, traumatic, physical and chemical agents) and to the high morphological variability of the human teeth. The human identification in Forensic Dentistry is made by two ways: comparative and reconstructive. The identification allows to determine several parameters of forensic interest: specimen, population affinity, sex, age, stature and individualization's factors. The Forensic Dentistry is one of the most important fields in individual identification, because teeth have less variability in the chronology of events in terms of the reconstructive way. On the other side, in terms of the comparative way, this area is also important, because of the individualization's factors: positive identification in individual cases and in mass disasters. In this forensic case report, a homicide case, the objective of the medico-legal investigation was a positive identification of the unidentified corpse found one year after the crime, July 2010. The Portuguese Criminal Police of Lisbon, Homicide Group, requested to South Branch of the Portuguese National Institute of Forensic Medicine, a forensic examination by a Forensic Odontologist for dental positive identification. The objectives were: 1) *post mortem* reconstruction of the dental status of the victim; 2) obtain the *ante mortem* information of the presumable victims; 3) comparison of the *post mortem* information with the *ante mortem* information, for a positive identification of the presumable homicide victim. Materials and methods: in this field of dental investigation, the guidelines of the International Organization of Forensic Odontology were used for reconstruction of the *post mortem* dental profile, to register *ante mortem* information of the presumable victims and to compared for individualized dental factors, by using Interpol DVI Forms for Individual Case, *post mortem* and *ante mortem* forms F1 and F2. Results: the unidentified victim of homicide was positive identified where it was established the identity by more than 12 individual dental characteristics. Conclusion: the Forensic Dentistry is a very important and simple field for individual identification of unidentified corpses for application of the criminal law.

1. Introduction – events' history

On the 27 of July of 2010 an unidentified skeletal was found, near a Portuguese city Cascais by the Portuguese Criminal Police and related to presumable homicide crime one year before in June of 2009 with a disappeared man. For application the sanction of penal Portuguese law, homicide crime, it is necessary the identification of the victim.

In the same day was requested the forensic examination by a Forensic Odontologist at the South Branch from the Portuguese National Institute of Legal Medicine for a positive identification of the unidentified body. This was realized on the 5 of August of 2010.

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2. Oral autopsy

2.1. Post mortem identification

The body was carried in a body bag and was manual inspected for discovered all bones and teeth. For Forensic Dentistry was important the presence of the skull with the upper jaw, the lower jaw and the isolated teeth (Fig. 1). The skeletal was incomplete with age between 30 and 50 years old.

The point 45 of the *post mortem* D Interpol Form was verified[1]: there were dental fillings, dental prosthodontic rehabilitation with crowns and bridges, and the presence of the upper and lower contention in the lingual/palatal surfaces of the anterior teeth suggested *ante mortem* orthodontic treatment (Fig. 2).

The *post mortem* F1 Interpol Form was verified. The teeth were identified with the two digits according to the FDI system.[2] The upper and lower jaws were completed (Fig. 3a and b). On the vestibular surface of the alveolar bone related to the teeth 12, 13 and mesial root of the 46 were verified fractures occurred at the *post mortem interval*. There was observed *post mortem* loss of the teeth 21, 22, 35, 43 and 45. These were explained by the manipulation of the cadaver at the crime scene. There was no evidence of *ante mortem* traumatic lesions in the jaws. Was discovered in the body bag the following isolated teeth: 11, 13, 23, 34, 44 and 32 to 42 (maintained together by the metal alloy from the splint, Fig. 1). The anatomy of the skull and lower jaw was compatible with a man.

According to the guidelines from the International Organization of Forensic Odontology (IOFOS),[3] the forensic report of individual identification must contain also the F2 Interpol *post mortem* form. The oral autopsy was performed to fill this form by the codes according to the System of Solheim.[4] The point 86, Dental findings with the odontogram, of this form was filled with this information:

- The missing teeth (code X) were 18, 17, 16, 15, 12, 24, 25, 26, 28, 38, 37, 36, 47 and 48.
- The teeth lost *post mortem* (code Y) were 21, 22, 35, 43 and 45.
- The sound teeth (code S) were 13, 11, 23, 34, 33, 32, 31, 41 and 42.
- The filled teeth (code F) were: 14 (F am D, F t MOD), 27 (F am O), 44 (F am O mes, F am O dis) and 46 (F am ODL, F t V).
- The teeth with crowns (code K) where the abutment were osteointegrated implants of titanium alloy and the prosthodontic rehabilitation was porcelain–metal: 12, 37 and 36 (Fig. 4a and b).
- The bridges (code B) where the abutments were osteointegrated implants of titanium alloy: bridge with 2 elements, 16 and 15, where the abutment replacing the 16 was an implant with a cantilever to 15 (pontic bridge) performed with porcelain–metal prosthodontic (Fig. 5); and the other bridge with 3 elements from 24 to 26, where the 24 was a cantilever (pontic bridge) and the 25 and 26 were replaced by implants abutments rehabilitated with porcelain–metal prosthodontic (Fig. 6a and b).

Fig. 1. The skeletized body was incomplete, with age between 30 and 50 years old. The upper and lower jaws were complete.

Fig. 2. The lower jaw: the anterior teeth had a fixed orthodontic contention with metal alloy and composite at the lingual surfaces. This forensic observation is compatible with *ante mortem* orthodontic treatment.

The point 87 from the F2 *post mortem* form (Specific description) was filled with the oral autopsy information concern with:

- The color of the prosthodontic rehabilitation was monochromatic compatible with A3 from Vita Scale Color from Ivoclar®.
- The implant from 12 had *ante mortem* alveolar bone loss.
- All the prosthodontic implant rehabilitation were cemented and not screwed.

The point 88 from the F2 *post mortem* form (Further findings) was filled with:

- Presence of orthodontic contention in lingual/palatal surface of upper teeth (from 11 to 23) and lower teeth (from 33 to 42, no information about 43, *post mortem* lost), with metal alloy and composite resin. This finding was compatible with orthodontic treatment during life, in a period of time just near the time of dead.
- Green pigmentation in distal root from vestibular surface of the 46 tooth compatible with amalgam filled corrosion.
- Alveolar bone loss of 7 mm in 27 tooth from vestibular and palatal surfaces with the furcation area visible.
- The surfaces of temporomandibular articulations without morphological alterations compatible with pathology.
- Occlusion with canine guide between the 33 (occlusion attrition in vestibular surface) and the 13 (occlusion attrition in the cusp).
- Without smoking pigmentation.

The supplementary examination performed were photography's and intensification images (point 90 of the *post mortem* form). The tooth 46 had an image compatible with root filled and metallic post in distal root (Fig. 7a and b). The estimated age was between 35 and 45 years old using clinical method (point 91 of F2 form).

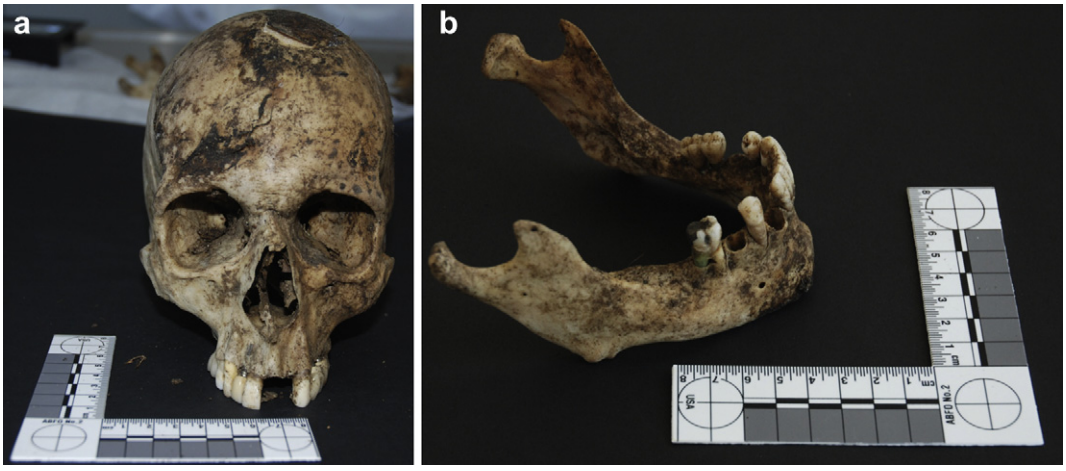

Fig. 3. (a) Upper jaw and (b) Lower jaw. There was *post mortem* loss of teeth 21, 22, 35, 43 and 45. This fact was explaining by the *post mortem* manipulation of the cadaver at the crime scene.

2.2. *Ante mortem identification*

The A1 and A2 *ante mortem* forms were filled with: who and when gave the dental clinical information; the phone contact, the address and the name of the dentist. Is this forensic case was a private Portuguese Dental Clinique with a single dentist that treated the missing person. Also we filled at point 19 the documents obtained, the official records, the dental records and the dental X-rays. The point 45 of the D2 *ante mortem* form was filled with the resume of the information of the F1 and 2 *ante mortem* forms. In this case we resumed the dental condition of the missing person: he had crowns, bridges, implants, treated teeth and in other information he had orthodontic treatment until 2007 and then he putted an upper and lower contentions.

The F1 and F2 *ante mortem* forms are the endpoints for forensic odontologist. At the F1 we filled the following points: the 76 item with the missing person address; the 77 item with the date of his disappearance, missing since 25 of June 2009; the 78 item, the circumstances of the disappearance was filled according to the information gave by the Portuguese criminal homicide investigation where he was a disappeared HIV-positive homosexual men with an active relationship and his car was found with criminal evidences without him; the 79 item filled with who gave the dental information, in this forensic case was the family who gave the name of the private Clinique and this one gave all the dental information. The dental information was provided by a unique dentist/institution, and we filled the 80 item with the address, the phone, the email, the period covered (from 17 of October 2005 to 7 of April 2008) and the documents obtained (X-rays and records).

The 86 item (dental findings with the odontogram) of F2 *ante mortem* form was filled with this information:

- The missing teeth, extracted (code X) were 18, 17, 16, 15, 12, 24, 25, 26, 28, 38, 37, 36, 47 and 48.
- The sound teeth (code S) were 13, 11, 21, 22, 23, 35, 34, 33, 32, 31, 41, 42 and 43.
- The filled teeth (code F) were: 14 (F am D, F t MOD), 27 (F am O), 44 (F am O mes, F am O dis) and 46 (F am ODL, F t V, Pos D) with root-filled.
- The teeth with crowns (code K), where the abutments were osteointegrated implants of titanium alloy and the prosthodontic rehabilitation porcelain–metal were: 12, 37 and 36.
- The bridges (code B), where the abutments were osteointegrated implants of titanium alloy were two: one of the bridge with 2 elements, teeth 16 and 15, where the abutment replacing the 16 was an implant with a cantilever to 15 (pontic bridge) performed with porcelain–metal prosthodontic; and the other bridge with 3 elements from 24 to 26, where the 24 was a cantilever (pontic bridge) and the 25 and 26 were replaced by implants abutments rehabilitated with porcelain–metal prosthodontic.

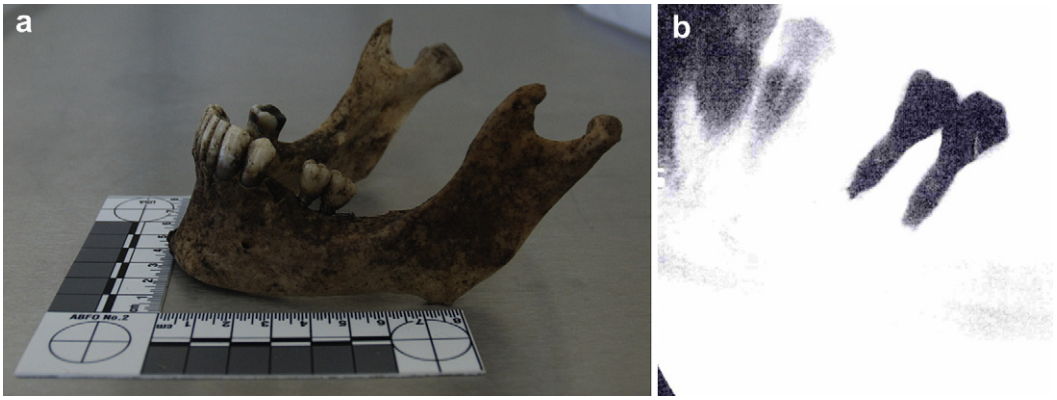

Fig. 4. The abutments of the crowns of the teeth 37 and 36 were osteointegrated implants of titanium alloy and the prosthodontic rehabilitation were porcelain–metal (a). The intensification image showed the implants and their morphology (b).

Fig. 5. Porcelain–metal prosthodontic bridge with 2 elements, teeth 16 and 15, where the abutment replacing the tooth 16 was an implant with a cantilever to the tooth 15 (pontic bridge).

The 87 item of the F2 form was filled with specific data:

- Implants at the teeth 16, 12, 25, 26, 37 and 36.
- The implant of the tooth 12 was made after orthodontic treatment. The others were made before this.
- All the prosthodontic implants rehabilitation were cemented.

The 88 item of the F2 form was filled with the dental information about the orthodontic treatment. At the time of disappearing he had fixed contention in upper jaw from 11 to 23 and in lower jaw from 33 to 43, both in lingual side with metal alloy and composite. The type of X-ray available (89 item) was 3 panoramic X-ray and the last one from 30 of November of 2006 (Fig. 8), was done before the dental treatment with the chirurgic phase for the collocation of the implant replacing the tooth 12.

3. Results

3.1. Comparison report

With the *ante mortem* and *post mortem* reports in the hand they may easily be compared. The teeth should be compared tooth for tooth as well as other types of information. For this forensic case was obtained the following dental correspondence:

- Missing teeth: 18, 17, 16, 15, 12, 24, 25, 26, 28, 38, 37, 36, 47 and 48.
- Sound teeth: 13, 11, 23, 34, 33, 32, 31, 41 and 42.
- Filled teeth: 14 (F am D, F t MOD), 27 (F am O), 44 (F am O mes, F am O dis) and 46 (F am ODL, F t V, Pos D) with root-filled.
- Teeth with crowns where the abutment were osteointegrated implants of titanium alloy and the prosthodontic rehabilitation were porcelain–metal: 12, 37 and 36.
- Bridges where the abutments were osteointegrated implants of titanium alloy: one of them a porcelain–metal prosthodontic bridge with 2 elements, teeth 16 and 15, where the abutment replacing the tooth 16 was an implant with a cantilever to the tooth 15 (bridge pontic); and the other bridge with 3 elements from the tooth 24 to 26, where the tooth 24 was a cantilever (bridge pontic) and the teeth 25 and 26 were replaced by implants abutments rehabilitated with prosthodontic porcelain–metal.
- The anatomic position of the implants at the tooth 16, 12, 25, 26, 37 and 36. All the prosthodontic implants rehabilitation were cemented.
- The morphology of each bridge, mainly the morphology of each cantilever.
- The presence of fixed contention in upper jaw from the tooth 11 to 23 and in lower jaw from the tooth 33 to 42, both in lingual side with metal alloy and composite.

Individually for this comparison we had 35 concordant dental details.

4. Discussion

When *ante* and *post mortem* registrations have been compared the result must be evaluated. A conclusion must be drawn where the reasons are stated. The police must be informed about the result as soon as possible. The report in this medico legal case was done in the same day of the oral autopsy and the police was informed in the same day.

The adult dentition is comprised of 32 teeth, each tooth possesses 5 surfaces visible on oral examination. The innumerable combinations of missing teeth, filling materials, carious lesions and prostheses involving 160 surfaces form the basis for dental identification. Specific morphologic patterns of individual restorations (fillings and crowns), features incorporated within root canals, periapical and surrounding bone enhance characterization. There are more than 2.5 billion possibilities in charting the human

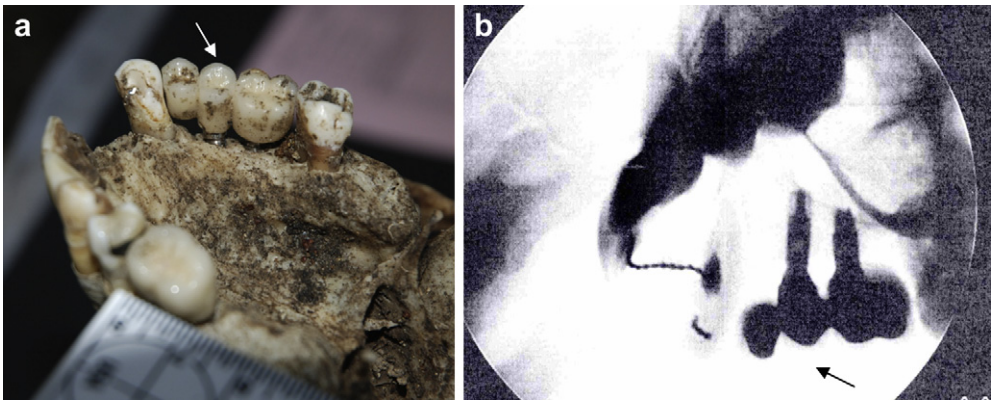

Fig. 6. A porcelain–metal prosthodontic bridge with 3 elements from the tooth 24 to 26, where the tooth 24 was a cantilever (pontic bridge) and the teeth 25 and 26 were replaced by implants abutments (a). The intensification image showed the morphology of the forensic examination (b).

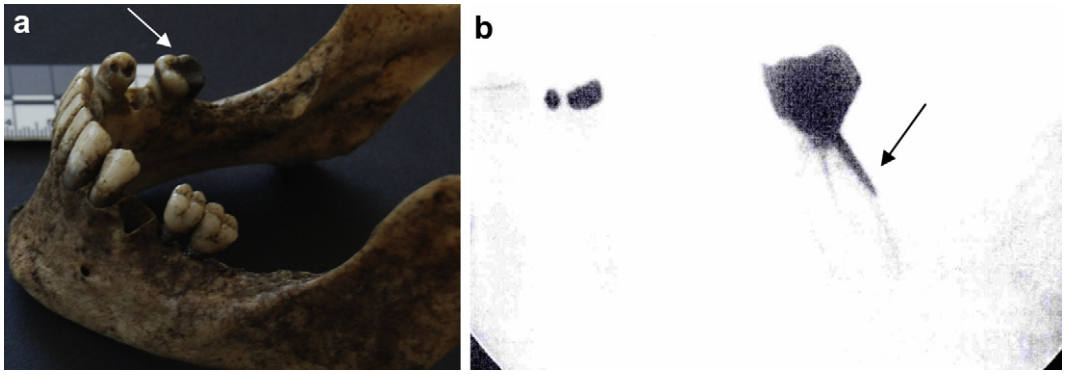

Fig. 7. The tooth 46 with a code F am ODL, F t V (a) and the intensification image compatible with root filled and metallic post in distal root of the tooth 46 (b).

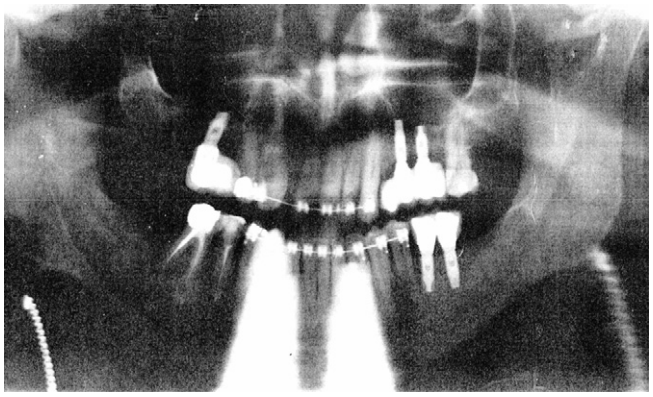

Fig. 8. The last panoramic X-ray from 30 of November of 2006, showed the *ante mortem* orthodontic treatment after the rehabilitation with the implants of the teeth 16, 25, 26, 37 and 36. The implant of the tooth 12 was not present at this time.

characterization.[5] The concept that no two dentitions are alike is the base premise of dental identification.

Many different conclusions have been used by forensic odontologists. Some are of the type identity or not identity. Others try more to express how likely identity may be. We believe the latter approach is best. It is our responsibility to tell the police how much evidence for the identity is in the concordant dental features. The conclusion should be like a verdict. Either the evidence is so strong that identity is the conclusion. It may also be that the evidence against identity is so conclusive that it can be excluded. This may even be so in cases where the dental evidence may not exclude identity and even contain details that are considered as positive for the identification. In other cases the evidence may be inconclusive both for and against the assumed identity.

The conclusion recommended by the Interpol form it is based on Keiser-Nielsen three different grades.[6] The optional conclusions are: identity established (12 or more uncharacteristic concordant features), identity probable (between 8 and 11 uncharacteristic concordant features) and identity possible (less than 8 concordant details).

In this medico legal case we had 35 concordant dental details. The identity was established. The conclusion was based on the following concordant details:

- 14 missing teeth (teeth 18, 17, 16, 15, 12, 24, 25, 26, 28, 38, 37, 36, 47 and 48),
- 9 sound teeth (teeth 13, 11, 23, 34, 33, 32, 31, 41 and 42),
- 4 fillings (teeth 14, 27, 44 and 46),
- 1 root canal fillings (tooth 46),
- 3 crowns over implants (teeth 12, 37 and 36),
- 2 bridges over implants (teeth 16, 15, 24, 25 and 26),
- 2 fixed contention after orthodontic treatment (from tooth 11 to 23 and from tooth 33 to 42).

5. Conclusion

At the last page of Interpol victim identification report we concluded that the identity was established and resumed the dental concordant features. We certificated the identification and assigned. In this medico legal case the cadaver found at 27 of July 2010 was established to the missing person from 25 of June 2009. This was related to a homicide crime. For penal law establishing crime is necessary the identification of the victim and this forensic endpoint was obtained.

Ethical approval
None declared.

Funding
None declared.

Conflict of interest
In this case report any identification of the process or names or files numbers are identified. There is no conflict of interest.

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